NYCTIBATRACHUS HUMAYUNI, A NEW FROG FROM THE WESTERN GHATS, BOMBAY[1]

BY

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(*With a plate*)

With field notes by Humayun Abdulali

In August 1953, Mr. Humayun Abdulali of the Bombay Natural History Society collected five frogs and a few tadpoles which he believed to be *Nyctibatrachus major,* from a wayside hill-stream at Khandala, Western Ghats, Bombay, and sent them to us for determination. In October of the same year, he supplemented this collection with a few more tadpoles collected from some hill-streams on the Devimani and Bundel Ghats near Sirsi in North Kanara, South Bombay. In November, at his instance, Mr. D. J. Panday collected two frogs and a few tadpoles from a stream at Mahableshwar. This material was also at our disposal for study.

The frogs though agreeing in general with Boulenger's (1882) description and figure of *N. major* did not agree with any of the named material in the Reserve Collection of the Zoological Survey of India. On comparison with a topotype of *N. major* from Malabar, kindly loaned by Dr. H. W. Parker of the British Museum of Natural History, we find that the Khandala and Mahableshwar frogs are specifically distinct from *N. major.* Incidentally it may be pointed out here that a couple of frogs that were later collected by Mr. J. C. Daniel of the Prince of Wales Museum, Bombay, in Travancore agreed fully with the topotype of *N. major.*

With the intention of studying the frog in its natural surroundings and obtaining more material, Mr. Abdulali persuaded Dr. Bhaduri to visit Khandala and Mahableshwar during his short visit to Bombay in the first week of August 1954. Bombay had, however, experienced an unusually heavy monsoon, the rainfall on August 7 being ten inches. Only a single tadpole isolated in a small puddle was noticed in the Khandala stream where Mr. Abdulali had seen many frogs and tadpoles on 18th July. All the wayside streams were in torrents where no frogs were visible. Panchgani and Mahableshwar were also excessively wet. Except for the constant call of the elusive *Philautus bombayensis* in the hilly tracts of Khandala, Panchgani and Mahableshwar, and a number of the interesting tadpoles of *Rana leithii*

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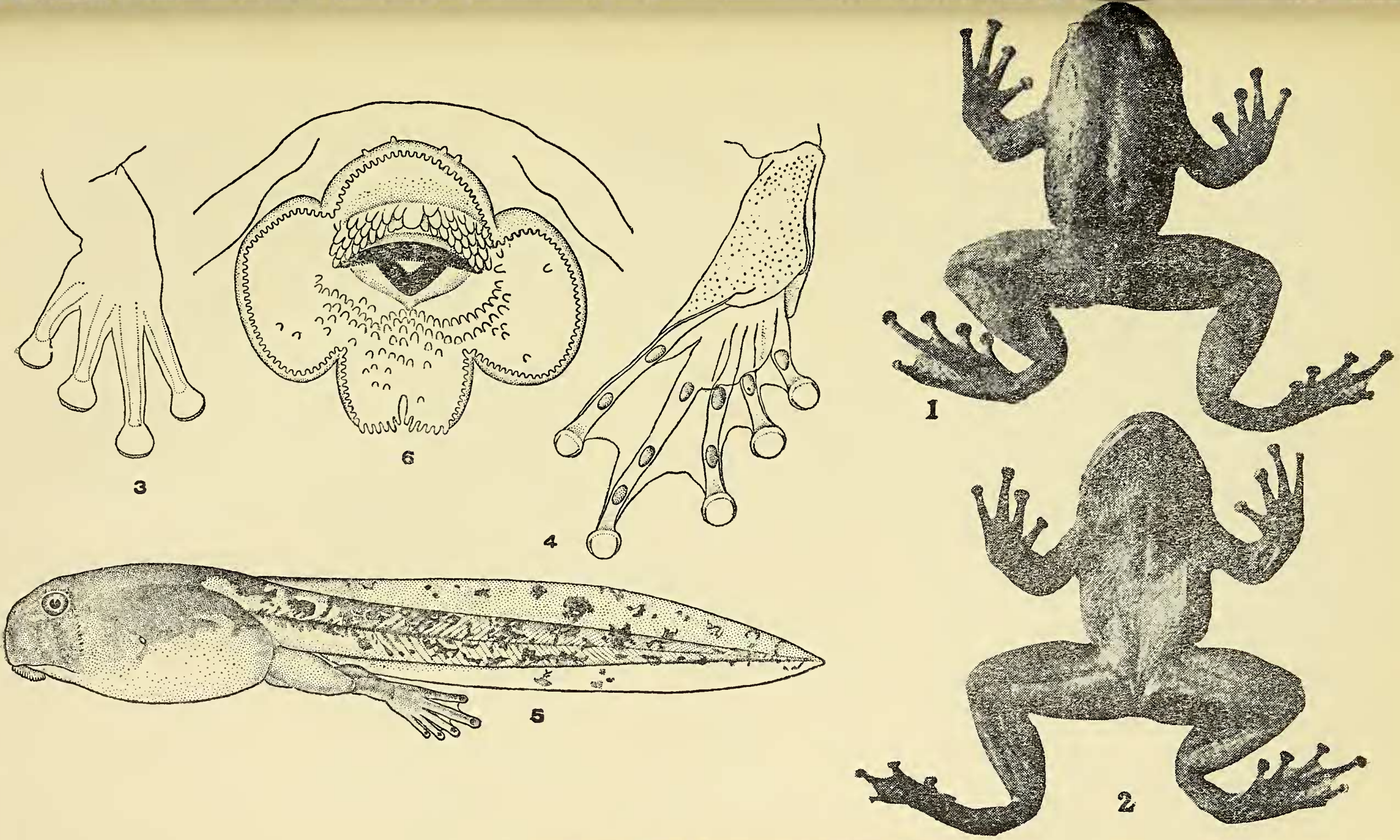

Nyctibatrachus humayuni, new species

Fig. 1. Dorsal view. (nat. size)
Fig. 2. Ventral view. (nat. size)
Fig. 3. Ventral view of hand, showing circummarginal groove ($\times 2\frac{1}{3}$).
Fig. 4. Ventral view of foot ($\times 2\frac{1}{3}$).
Fig. 5. Lateral view of tadpole ($\times 2\frac{1}{3}$).
Fig. 6. Mouth disk of the tadpole ($\times 14\frac{2}{3}$).

which kept to almost vertical wet rocks at Panchgani, we saw very little of Salientian interest. It seemed that weather conditions were not favourable for the free movement of frogs.

Mr. Abdulali first discovered these frogs at Khandala and collected tadpoles fom other localities. In recognition of the amphibian collections which he has been making within recent years, we have much pleasure in describing this new species after him.

Nyctibatrachus humayuni new species

Diagnosis: A *Nyctibatrachus* with an erect pupil; tongue free and deeply notched behind; vomerine teeth behind the chaonae, in transverse patches, each with a single row of teeth; tympanum hidden; fingers free, toes webbed, tips of all digits strongly dilated into large disks with a deep horizontal circummarginal groove separating the upper from the lower surface; outer metatarsals separated by web. Omosternum forked at the base and sternum with a bony style. Terminal phalanges bifurcate.

Holotype. Adult male, Z.S.I. Cat. No. 20628 (B.N.H.S. Cat. No. 576); collected from a wayside hill-stream, Mahableshwar, Satara District, Bombay, by Mr. D. J. Panday on November 17, 1953.

Paratypes. Six specimens: one male, B.N.H.S. Cat. No. 577, collected at the same place and on the same date as the holotype by Mr. D. J. Panday, and five specimens, B.N.H.S. Cat. Nos. 775, 427-430, consisting of two males, two females and one juvenile from a wayside hill-stream, Khandala, *ca.* 1,500 ft., Bombay, collected by Mr. Humayun Abdulali on August 30, 1953. Three each are deposited in the collections of the Zoological Survey of India and the Bombay Natural History Society.

Description. Body depressed and stout, not constricted at the waist. Head depressed and distinctly broader than long; snout short and rounded, not projecting beyond the mouth, nearly equal to the diameter of the eye; without canthus rostralis; nostril midway between the tip of the snout and the anterior corner of the eye; eyes prominent with a vertical pupil, directed forwards and upwards; upper eyelid narrow; interorbital space about twice the width of the upper eyelid and broader than internarial space; tympanum obscure, hidden under the skin; tongue moderately large, free and deeply notched behind; vomerine teeth patches in two slightly oblique series, each with a single row of 6-8 teeth, separated by a narrow space, and set well behind the choanae.

Forelimb rather stout, fingers free and moderately long, somewhat flattened dorsoventrally; first finger shorter than second, third finger longest, fourth finger just reaching the base of the disk of the third finger, second slightly shorter than fourth. Tips of all the fingers dilated into large disks with a horizontal circummarginal groove separating upper from lower surface; disks practically of the same size except the fourth which appears to be slightly smaller. Subarticular tubercles feebly prominent, one or two tubercles on the palm.

Hindlimb stout and moderately long, the tibiotarsal articulation reaching beyond the eye; toes webbed and somewhat flattened fourth toe the longest, third and fifth subequal, nearly reaching the distal subarticular tubercle of the fourth, the second nearly reaching the distal subarticular tubercle of the third, and the first reaching a little below the base of the disk of the second; toes fully webbed except the fourth on which the web reaches the distal subarticular tubercle, with fringes continuing to the base of the disk; tips of all the toes dilated into large disks with a horizontal circummarginal groove separating upper from lower surface; subarticular tubercles moderately developed; a deep fold of skin on the outer side of the fifth toe; a small elongate inner metatarsal tubercle; no outer metatarsal tubercle.

Measurements in millimetres

		♂	♂	♂	♂	♀	♀	Juv.
Sex		1	2	3	4	5	6	7
Body length	...	41	46	36	34	47	48	17
Head length	...	12	15	12	11	15	16	...
Head width	...	17	20	15·5	15	20	19	...
Snout	...	6·5	7	5·5	6	6·5	6·5	...
Eye	...	5·5	6	5	4·5	7	6·5	...
Interorbital space	...	6	6	5	5	6	6	...
Arm length	...	25	2	20	20	26	25	...
Hand length	...	14	14	11	11	14	14	...
Disk of third finger	...	2	2	2	2	2	2	...
First finger	...	8·5	9	6·5	7	9·5	9	...
Second finger	...	11	11·5	9	9	11	10·5	...
Third finger	...	14	14	11	11	14	14	...
Fourth finger	...	12	12	10	9	11·5	11·5	...
Leg length	...	64	66	54	50	68	66	...
Tibia length	...	21	22	18	18	22	21	...
Foot	...	22	22	18	17	22	22	...
Disk of fourth toe	...	2	2	2	2	2	2	...
Fifth toe	...	15	16	12	12	14	14	...
Fourth toe	...	19	19	16	15	20	19	...
Third toe	...	15	14·5	13	12	15	15	...
Second toe	...	11	11	9·5	9	10·5	10·5	...
First toe	...	7	7	6	7	7·5	7	...
Inner metatarsal tubercle	...	3·5	3	3	3	3	3·5	...

1. Holotype from Mahableshwar. 2. Paratype from Mahableshwar. 3–6. Paratypes from Khandala. 7. A juvenile specimen from Khandala.

Skin above with very small closely set vermiculated folds; a rather distinct oblique fold beneath the eye; upper eyelid with strong tubercles.

Colour (in alcohol) grayish or brownish black dorsally conforming to the rock, with markings, if present, irregular and darker; ground colour of ventral parts slightly gray and usually with dark mottlings on the chin and the throat; limbs with indistinct, or without, dark cross bars or spots.

Sexes not distinguishable externally. Males with no vocal sacs. Testis small and oval. Ovum in one of the female specimens measures about 2.7 mm.

Habitat. Hill-streams, living under the stones in crevices.

Remarks. So far four species of the genus *Nyctibatrachus* are known. These are *N. pygmaeus* (Günther 1875) from the Anamallai Hills, *N. major* Boulenger 1882 from Malabar and Wynad, *N. sanctipalustris* Rao 1920 from Coorg and lastly *N. sylvaticus* Rao 1937 from Hassan, Mysore. While describing the last-named species, Rao observed that the former three species were present in good numbers in the zoological collections of the Central College Bangalore.

Myers (1942) rightly suggested *N. major* to be the type species of the genus.

N. humayuni is closely related to *N. major* in all the essential characters, especially in having fully-webbed toes and tips of digits dilated into disks. But it is distinct from *N. major* in that its disks are very much larger and provided with a deep circummarginal groove separating the upper from the lower surface. Furthermore, in coloration *N. major* is brownish, while *humayuni* is grayish black.

Distribution. Western Ghats (N. Kanara, Mahableshwar and Khandala), Bombay.

Until now *Nyctibatrachus* has been recorded in Anamallai Hills, Wynaad, Coorg and Mysore. With the discovery of *N. humayuni* the range of distribution of the genus extends northwards to Khandala through N. Kanara and Mahableshwar.

DESCRIPTION OF THE TADPOLE

The tadpoles are of moderate size; the head and body narrowly oval, flattened moderately, the ventral surface being slightly convex; the snout region bluntly rounded and depressed, the nostrils rather widely separated, nearer the tip of the snout than the eyes, the distance between them being less than the interorbital width; the eyes are dorsolaterally placed, directed forwards and upwards, situated at about one-third the distance between the tip of snout and the base of hindlimbs, nearer the tip of the snout than the spiracle. The spiracle is lateral, sinistral, tubular, pointing upwards and backwards, nearly midway between the tail and the tip of the snout. The vent is dextral and tubular.

The tail which is about one and a half times as long as the head and body, gradually tapers to a rather blunt point. The tail membrane is deeper dorsally, decreasing in height towards the base of the tail. The dorsal and ventral membranes arise just behind the base of the hindlimbs. The muscular portion is strongly developed tapering to a fine point.

The mouth-disk is small, directed downwards and a little backwards. The mouth is surrounded by anterior and posterior lips which are continuous through lateral folds. The anterior lip is distinct, crescentic in shape and can be closed down over the mouth. It is fringed with short, blunt papillae and shows 3-4 rows of similar papillae at its base just above the upper beak. The posterior lip is divided into three lobes, of which two are lateral in position and slightly larger than the posterior mesial lobe; the upper part of these lobes is capable of being folded backwards, the posterior mesial lobe may be broken into two or more sublobes which are edged with short processes; similar processes are scattered on the three lobes near the base of the lower beak. Both parts of the beak well developed, the upper beak relatively broader than the lower, which is a little stouter and V-shaped; both parts finely serrated; the upper is entirely black and the basal part of the lower beak is white.

The colour of the dorsal surface of the head and body and muscular portion of the tail is dark brown with irregular darker markings. The ventral surface is whitish.

Measurements (in millimetres) of a specimen with legs half developed:

Total length	47
Length of head and body	18
Body width	8·5
Tail length	29
Tail height	6

SPECIMENS OF TADPOLES EXAMINED

Reg. No. B.N.H.S.	Locality	Date	Collected by	No. of tadpoles
578	Mahableswar, Bombay ...	17-11-1953	D. J. Panday	8
776	Khandala, Bombay ...	30-8-1953	H. Abdulali	6
422	,, ,, ...	,,	,,	3
572	Stream under culvert No. 211, on Bundel Ghat, 1,500 ft., N. Kanara.	20-10-1953	,,	14
566	,, ,,	23-10-1953	,,	4
*571	Stream under culvert No. 413 Khandala.	19-10-1953	,,	3
*569	In eddy of small flowing stream of Devimani Ghat, 1,500 ft., Sirsi District, N. Kanara.	20-10-1953	,,	2

Remarks. Among the different lots of tadpoles examined by us, the tadpoles from Mahableshwar represent a good series of the main developmental stages. An almost metamorphosed frog shows nearly all the characters of the adult already described.

Annandale (1918) described the tadpoles of *Nyctibatrachus pygmaeus*, *Rana leptodactyla* and *R. semipalmata* among the many other tadpoles from south India. In the following year he made a correction by referring the *N. pygmaeus* tadpoles to those of *Philautus* (=*Ixalus*) *variabilis*. Incidentally, he has, however, mentioned that the true tadpoles of *Nyctibatrachus* resemble those of *R. semipalmata* in having no horny teeth on the mouth-disk. Unfortunately, he never described these *Nyctibatrachus* tadpoles afterwards.

Rao (1920) recorded the spawning of *R. leptodactyla* from Coorg and described its life history by rearing up the larvae with horny teeth up to two-legged stage. It may, however, be remarked that

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* Numbers marked with an asterisk, were examined by Dr. Bhaduri at Bombay.

Annandale (1918, p. 20) relied for the identification of the tadpoles of *R. leptodactyla* on rather circumstantial evidence and on their apparent resemblances with those of *R. semipalmata.* Rao is, therefore, quite right in pointing out that tadpoles described by Annandale as *R. leptadactyla* do not belong to that species and may prove to be one of the species of the genus *Nyctibatrachus.*

So far only the tadpoles of *N. sanctipalustris* have been described from the hill-streams of Hebbe and Huthode (Kadur, Mysore) at an elevation of 4,000 ft., by Rao in 1920. These tadpoles are very much different from those of *N. humayuni* in possessing the labial teeth rows with the formula, 1 : 1—1/3. *N. humayuni* tadpoles as recorded above are devoid of any labial teeth rows, and they bear a close resemblance to Annandale's *R. leptodactyla* tadpoles.

ACKNOWLEDGEMENT

We take this opportunity to record our sincere thanks to Mr. H. Abdulali and Dr. H. W. Parker for helping us in various ways in this study. Our thanks are also due to Sri Subodh Mandal and Sri R. C. Bagchi for the illustrations in the accompanying plate.

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FIELD NOTES ON THE WRINKLED FROG

On August 9, 1953, while looking for frogs and fish in a rocky monsoon stream at Culvert 413, half way up the ghat between Khopoli and Khandala (*ca.* 1,500 ft.), I saw a large frog seated on a flat rock covered with algae and wetted by the flowing water. During my attempts to catch it, the frog was twice washed into the stream, but it immediately landed on the nearest rock and then sat still, not unlike a toad. In the hand, however, the disks on the fingers and toes were noticeable and the vertical pupil was also distinctive (after one's attention had been drawn to it !). Tadpoles, apparently of this species, were also found at the bottom of a pool formed by an eddy about 20 yards downstream. Though several were seen, they were not very numerous and gave no suggestion of living together in shoals as is common with some other species. The small loach—*Nemachilus evezardi* was present in an adjoining, but not in the same pool.

Another visit on the night of August 30th and the following morning produced two more frogs and some tadpoles distributed over small pools in the same stream. On no occasion were more than six to eight tadpoles seen together in the same pool and these were also in different stages of metamorphosis. Later in the year the stream was completely dry.

On 18th July 1954, at Khandala, I again saw some adults in the same stream, and on 29th August noted tadpoles of varying sizes in the Waghdhondi stream near the Kathori village between the Khandala Hotel and Duke's Nose, and also in a small pool in a stream hardly more than a trickle, under the hills known as 'The Sausages'.

Only a solitary tadpole was noticed when I visited Culvert 413 with Dr. Bhaduri on 7th September. The assumption that heavy rains had then driven them into refuge is substantiated by the abundance of tadpoles in the same stream on 21st September. By 30th October the stream was almost dry and none were seen.

From 19th to 25th October 1953 I had the opportunity of visiting the Devimani and Bundel Ghats near Sirsi, in North Kanara, and obtained many tadpoles under similar conditions. No adults were obtained. Mr. Dinsha Panday then obtained some further specimens of this frog from Mahableshwar together with tadpoles.

Tadpoles and frogs were also seen in a stream flowing into Simpson's Tank at Matheran on 18th October, 1954.

The tadpoles though always found in pools in, or linked with, running streams always stay at the bottom in the relatively quiet water, which was seldom more than a few inches deep. They are not very agile, and when disturbed will take refuge under overhanging rocks and stay there for some time.

Messrs. Daniel and Chari of the Prince of Wales Museum visited Mahableshwar on 10th December 1954 and saw large numbers of these tadpoles of different sizes. Tadpoles have now been noted between 9th August 1953 (Khandala) and 10th December which indicates either a long period of metamorphosis or a prolonged breeding season, both of which again might be variable.

Early in November 1954 I was at Mahableshwar, and in the streams where we had drawn a blank earlier with Dr. Bhaduri, considerable numbers of adults and tadpoles in all stages were seen. From my previous notes I had put this frog down as a diurnal species, but a stream on the Fitzgerald Ghat was visited at night and much larger numbers seen, than during daytime. Several were squatted in the spray of falling water and others attached to vertical sides of rock pools with the lower half of the body in water. In the same facies, but almost invariably out of water, were a large number of *Rana beddomii* and *R. temporalis*.

In colour, the adult Wrinkled Frogs were usually uniform blackish-grey above, this colour extending towards the under-side of the legs and body and gradually paling into white on the belly. The chin and throat were dark—almost as dark as the back. The upper surface is irregularly wrinkled and granulated with almost wartlike excrescences on the hind legs. This character distinguishes it from all other frogs of the neighbourhood, and I have therefore proposed 'The Wrinkled Frog' as an appropriate name for the species. A female collected in August 1953 had a patch of yellow on the undersurface of the femur near the anus, the colour extending halfway towards the knee. Another taken on 18th July 1954 had a similar patch which was noted as orangeyellow, but this specimen was unfortunately not sexed.

Occasional individuals, including a 1-in. frog, had tinges of brick-red on the head. The tadpoles were of a dark olive-green colour but with the tail mottled on a paler background.

On 18th July three individuals, about 1½ in. in length, were seen in the Khandala stream under Culvert 413. They were in flowing water, resting against the vertical wall of the culvert with their heads just out of water; if splashed they worked their way higher up on the wall (individuals in captivity can stick against vertical glass surfaces). About 18 in. above them were two small rectangular patches of eggs about 2 × 3 in. and about ¼ in. thickness (this would also be the diameter of each egg) stuck against the vertical wall. It is possible that these were the eggs of this species.

The stomachs of a few individuals examined contained Mayflies (*Heptagenia* sp.) in nymphal stages, water beetles (*Sphaeroderma* sp.) a Lycosid spider, remains of several insects and bits of the tape-like bryophytic weed (*Aspermytes khandalensis*), and an entire crab.

H.A.